



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
OSB2000-0314

April 6, 2001

Mr. Fred P. Patron
Senior Transportation Planning Engineer
Federal Highway Administration, Oregon Division
530 Center Street NE
Salem, OR 97301

Re: Formal Section 7 Consultation and Essential Fish Habitat Consultation for Rogue River Bridge Rehabilitation Project, Curry County, Oregon

Dear Mr. Patron:

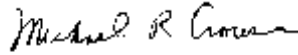
Enclosed is a biological and conference opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) that addresses the proposed Rogue River Bridge Rehabilitation Project in Curry County, Oregon. The NMFS concludes in this Opinion that the proposed action is not likely to jeopardize the Southern Oregon/Northern California Coasts (SONC) coho (*Oncorhynchus kisutch*), or destroy or adversely modify critical habitat. This Opinion includes reasonable and prudent measures with terms and conditions that NMFS believes are necessary and appropriate to minimize the potential for incidental take associated with this project.

In addition, this document also serves as consultation on Essential Fish Habitat (EFH) under Public Law 104-267, the Sustainable Fisheries Act of 1996, as it amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson Stevens Act).



Questions regarding this letter or attached Opinion should be directed to Frank Bird of my staff in the Oregon State Branch Office at (541) 957-3383.

Sincerely,


FR

Donna Darm
Acting Regional Administrator

cc: Rose Owens - ODOT (w/o attachment)
Bill Warncke - ODOT
Allen Lively - ODOT
Randy Reeve - ODFW
Max Mizejewski - ODOT (w/o attachment)

Endangered Species Act - Section 7
Consultation
and
Magnuson - Stevens Act
Essential Fish Habitat Consultation

BIOLOGICAL OPINION

Rogue River Bridge Rehabilitation Project

Agency: Federal Highway Administration

Consultation Conducted By: National Marine Fisheries Service,
Northwest Region

Date Issued: April 6, 2001

Refer to: OSB2000-0314

TABLE OF CONTENTS

1. ENDANGERED SPECIES ACT	1
1.1. Background	1
1.2. Proposed Action	1
1.2.1 Cathodic Protection	2
1.2.2 Scour Protection	2
1.2.3 Mitigation	3
1.2.4 Conservation Measures	3
1.3 Biological Information and Critical Habitat	3
1.4 Evaluating Proposed Actions	3
1.4.1 Biological Requirements	4
1.4.1.1 SONC coho salmon	5
1.4.1.2 KMP Steelhead	5
1.4.2 Environmental Baseline	6
1.5 Analysis of Effects	7
1.5.1 Effects of Proposed Action	7
1.5.1.1 Bridge Rehabilitation	7
1.5.1.1.1 Pile Installation and Removal and Containment Structure	7
1.5.1.1.2 Contaminated Water	8
1.5.1.1.3 Petrochemicals and toxic substances	8
1.5.1.1.4 Shading - Work Bridges	9
1.5.1.1.5 Staging Areas	9
1.5.1.2 Inwater Work Isolation Area and Fish Removal	9
1.5.1.3 Shading - Barge Use	9
1.5.1.4 Scour Protection	10
1.5.1.5 Mitigation	10
1.5.2. Effects on Critical Habitat	10
1.5.3. Cumulative Effects	11
1.6. Conclusion	11
1.7. Reinitiation of Consultation	12
2. INCIDENTAL TAKE STATEMENT	12
2.1. Amount or Extent of the Take	12
2.2. Reasonable and Prudent Measures	13
2.3. Terms and Conditions	14
3. MAGNUSON-STEVENSON ACT	19
4. LITERATURE CITED	23

1. ENDANGERED SPECIES ACT

1.1. Background

On December 28, 2000, the National Marine Fisheries Service (NMFS) received a biological assessment and request from the Federal Highway Administration (FHWA) for Endangered Species Act (ESA) section 7 formal consultation on the Rogue River Bridge (Patterson Bridge) Rehabilitation Project located in Curry County, Oregon, along the Oregon Coast Highway, U.S. 101, milepost (MP) 327.48 to MP 327.88. The FHWA is partially funding the proposed action, and is the lead Federal agency for the project. The Oregon Department of Transportation (ODOT) is the designated non-Federal representative for transportation actions funded by the FHWA in Oregon, and will administer the construction contract.

This biological opinion (Opinion) considers the potential effects of the proposed actions on the Southern Oregon/Northern California Coasts (SONC) coho salmon (*Oncorhynchus kisutch*), and the Klamath Mountains Province (KMP) steelhead (*Oncorhynchus mykiss*), which occur in the proposed action area. SONC coho salmon were listed as threatened under the Endangered Species Act (ESA) on May 6, 1997 (62 FR 24588). Critical habitat was designated on May 5, 1999 (64 FR 54049). Protective regulations for SONC coho were issued under section 4(d) of the ESA on July 18, 1997 (62 FR 38479). KMP steelhead were proposed as a threatened species under the ESA on February 12, 2001 (66 FR 9808). Critical habitat has not been proposed or designated for this species. The FHWA has requested a conference opinion for KMP steelhead.

The proposed actions are: 1) The cathodic protection of the existing bridge due to corrosion from salt intrusion of the surface and interior properties of the bridge; 2) construction of a new pier footing for pier 2 due to extensive scouring and channel degradation; and 3) FHWA/ODOT propose an out-of-kind compensatory mitigation planting plan for the loss of 1400 square feet of pool habitat associated with the scour protection, impacts from pile installation and removal, and impacts from untreated stormwater runoff discharged into the Rogue River Estuary. The Patterson Bridge is located at river mile (RM) 0.9 on the Rogue River. The project is currently scheduled to start in September of 2001 and is expected to be completed in September of 2005.

The objective of this Opinion is to determine whether the Rogue River Bridge Rehabilitation Project is likely to jeopardize the continued existence of the SONC coho salmon and KMP steelhead, or destroy or adversely modify designated critical habitat.

1.2 Proposed Action

The proposed actions involve: 1) The cathodic protection of the existing bridge due to corrosion from salt intrusion of the surface and interior properties of the bridge; 2) construction of a new pier footing for pier 2 due to extensive scouring and channel degradation; and 3) FHWA/ODOT propose an out-

of-kind compensatory mitigation planting plan for the loss of 1400 square feet of pool habitat associated with the scour protection, impacts from pile installation and removal, and impacts from untreated stormwater runoff discharged into the Rogue Estuary. A description of the three main project components is detailed below.

1.2.1 Cathodic Protection

The primary construction activity is to cathodically protect the integrity of the Patterson Bridge over the Rogue River (RM 1) along the Oregon Coast Highway, U.S. 101, MP 327.48 to MP 327.88. Due to the proximity of the bridge and the marine environment, the bridge has been subjected to high concentrations of salt on a continuum leading to corrosion of the bridge surface and interior properties. This condition has resulted in surface and interior fractures of the concrete which has exposed the steel rebar to the marine environment causing the rebar to expand, leading to additional fracturing of the concrete and compromises the integrity of the bridge.

Cathodic protection involves the application of elemental zinc to the surface of the bridge (post rehabilitation of the concrete), and an applied low voltage current to the bridge; this causes the corrosion process to work on the zinc coating instead of the surface and interior properties.

Cathodic protection requires a controlled environment for successful adhesion of the zinc to the bridge. In order to achieve a controlled environment, construction of two temporary work bridges, spanning the entire channel (approximately 0.4 mile), will be required to support the containment structure, construction equipment, and provide access to the bridge. This will involve the installation and removal of 700 piles to adequately support the work bridges. All pile driving and removal will occur within the established inwater work period (October 1 to April 30), with the exception of the first year when the inwater work window will be September 1 through April 30.

1.2.2 Scour Protection

In addition to the rehabilitation, construction of a new pier footing for pier 2 is required. This will involve isolating the work area from the active channel, removing of the existing sheet piling around the pier footing, and construction of a new pier footing. The ODOT has developed a conceptual plan for the new footing at pier 2. The conceptual solution is to extend the footing deeper into the river substrate with drilled concrete shafts. Large drill casings will be sunk into the channel bottom around pier 2. Rebar cages will be installed inside the casings and filled with concrete. A concrete encasement will be poured around the drilled shafts and the footing to secure the new footing of the pier. The number and size of concrete shafts is unknown. Barges may be used to install and remove the sheet piling, core-drilling activities, and activities associated with construction of the pier footing. The new footing will eliminate 1400 square feet of estuarine habitat, for a total footing area of 3180 square feet.

1.2.3 Mitigation

This activity is an out-of-kind compensatory mitigation planting plan for the loss of the 1400 square feet of pool habitat in association with the scour protection of pier 2, impacts associated with pile installation and removal, and maintaining stormwater runoff discharged from the bridge directly into the Rogue River Estuary without treatment. The mitigation site is located 1.5 miles upstream of the Patterson Bridge at RM 2.65 on the north bank of the estuary. Three areas will be planted for a total area of one acre. Site one is in the five-year floodplain adjacent to the estuary. Sites two and three are located along the banks of Ranch Creek, a tributary to the Rogue Estuary. All plantings will consist of native riparian vegetation.

1.2.4 Conservation Measures

The NMFS regards the conservation measures identified in the biological assessment to be an integral component of the proposed bridge rehabilitation and scour protection actions to minimize adverse affects to SONC coho salmon and KMP steelhead and their habitats, and considers them to be part of the proposed action.

1.3 Biological Information and Critical Habitat

The Southern Oregon/Northern California Coasts (SONC) coho salmon (*Oncorhynchus kisutch*) occur in the proposed action area. SONC coho salmon were listed as threatened under the (ESA) on May 6, 1997 (62 FR 24588). Critical habitat was designated on May 5, 1999 (64 FR 54049). Protective regulations for SONC coho were issued under section 4(d) of the ESA on July 18, 1997 (62 FR 38479). Critical habitat is designated to include all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers accessible to listed coho salmon between Cape Blanco, Oregon and Punta Gorda, California. The adjacent riparian zone is defined as the physical environment that may influence the following functions: Shade, sediment delivery to the stream, nutrient or chemical regulation, streambank stability, and the input of large woody debris/organic matter. Biological information for SONC coho salmon is found in Nehlsen et. al 1991; Nickelson et. al. 1992; and Weitkamp et. al. 1995. Long-term trends suggest that natural populations are not self-sustaining.

The Klamath Mountains Province (KMP) steelhead (*Oncorhynchus mykiss*) occur in the proposed action area. KMP steelhead were proposed as a threatened species under the ESA on February 12, 2001 (66 FR 9808). Critical habitat has not been proposed or designated for this species. Biological information for KMP steelhead is found in Busby et. al. 1994.

1.4 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). NMFS must determine whether the action is likely to

jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of: (1) Defining the biological requirements and current status of the listed species; and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributable to: (1) Collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmonid's life stages that occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will destroy or adversely modify critical habitat it must identify any reasonable and prudent alternatives available.

For the proposed action, NMFS' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for juvenile and adult migration, spawning, and rearing of the SONC coho salmon and KMP steelhead under the existing environmental baseline. NMFS' Essential Fish Habitat (EFH) analysis considers the effects of proposed actions on EFH and associated species and their life history stages, including cumulative effects and the magnitude of such effects.

1.4.1 Biological Requirements

The first step in the methods the NMFS uses for applying the ESA section 7(a)(2) to listed salmon and steelhead is to define the species' biological requirements that are most relevant to each consultation. NMFS also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its decision to list SONC coho salmon and KMP steelhead for ESA protection, and also considers new data available that is relevant to the determination.

The relevant biological requirements are those for SONC coho salmon and KMP steelhead to survive and recover to naturally reproducing population levels at which time protection under the ESA would

become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sufficient in the natural environment. For this consultation, the biological requirements are improved habitat characteristics that function to support successful adult and juvenile migration, spawning, and rearing.

1.4.1.1 SONC coho salmon

Adult SONC coho salmon enter the Rogue River Estuary from September through January, with peak entry occurring in October. Spawning occurs from October through December. River entry and spawning may extend through January, depending on flow and temperature regimes. Juvenile coho salmon outmigration generally occurs from March through June, with peak outmigration occurring in April and May. Juvenile outmigration patterns are strongly influenced by photoperiod, stream flows, water temperature, and the lunar phase.

The Rogue River Estuary is an important first-stage, freshwater acclimation zone for returning adult coho salmon prior to upstream migration. Specifically, returning adult coho salmon utilize the large, deep pool habitat located at RM 0.9. This deep pool habitat is directly beneath the Patterson Bridge, located between piers 1 and 2, and encompasses an area greater than 4.0 acres with depths greater than 35 feet. The deep pool habitat and the atypical estuarine conditions in the Rogue River Estuary are an important osmotic transition zone for anadromous salmonids. The Rogue River Estuary is a low-salinity estuary dominated by freshwater rather than tidal action. During high flow conditions, tidal influence is minimal, generally limited to the lower 0.5 mile of the estuary. During low flow conditions, tidal influence may extend as far as 2.7 miles upstream.

Juvenile coho salmon utilize the Rogue River Estuary to a limited extent. The Rogue River Estuary is a small coastal estuary and does not have a complex habitat structure with extensive slough subsystems and intertidal and marshland habitats. Juvenile coho salmon may utilize the Rogue River Estuary for a period of less than one week where they complete the smoltification process, then out-migrate to the ocean completing their ocean life-cycle.

Long-term trends suggest that natural populations of SONC coho salmon are not self-sustaining and at risk of extinction (NOAA 1994).

1.4.1.2 KMP Steelhead

Winter-run and summer-run steelhead co-occur in the Rogue Basin (NOAA 1994). Typically, winter-run steelhead enter the Rogue River Estuary from November through April; spawning occurs from December through May. Summer-run steel typically enter the Rogue River Estuary between June and September and spawn the following spring.

The Rogue River Estuary is an important first-stage, freshwater acclimation zone for returning adult steelhead prior to upstream migration. Specifically, returning adult steelhead utilize the large, deep pool habitat located at RM 0.9. This deep pool habitat is directly beneath the Patterson Bridge, located between piers 1 and 2, and encompasses an area greater than 4.0 acres with depths greater than 35 feet. The deep pool habitat and the atypical estuarine conditions in the Rogue River Estuary are an important osmotic transition zone for anadromous salmonids. The Rogue River Estuary is a low-salinity estuary dominated by freshwater rather than tidal action. During high flow conditions, tidal influence is minimal, generally limited to the lower 0.5 mile of the estuary. During low flow conditions, tidal influence may extend as far as 2.7 miles upstream.

Juvenile winter-run and summer-run steelhead outmigration generally occurs from March through June, with peak outmigration occurring in April and May. In the Rogue Basin, summer-run steelhead have an atypical life history strategy. These steelhead return to freshwater habitats in August and September and overwinter in the mid and upper reaches of the watershed. These steelhead will outmigrate the following spring in April and May and complete their ocean life-cycle. Juvenile outmigration patterns are strongly influenced by photoperiod, stream flows, water temperature, and the lunar phase. Juvenile KMP steelhead utilize the Rogue River Estuary to a limited extent. The Rogue River Estuary is a small coastal estuary and does not have a complex habitat structure - extensive slough subsystems and intertidal and marshland habitats. Juvenile steelhead may utilize the Rogue River Estuary for a period of less than one week where they complete the smoltification process, then out-migrate to the ocean completing their ocean life-cycle.

1.4.2 Environmental Baseline

The current range-wide status of the identified ESUs may be found in Nickelson et. al. 1992; and Weitkamp et. al. 1995. The identified action will occur within the range of the SONC coho salmon and the KMP steelhead ESUs. The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area (project area) involved in the proposed action (50 CFR 404.02). The direct effects occur at the project site and may extend upstream or downstream based on the potential for impairing fish passage, hydrologic functions and processes, stream channel modification, increase in sedimentation and turbidity, displacement of migrating coho salmon and steelhead, injury or killing of coho salmon or steelhead, and pollutant discharge into the Rogue River. Indirect effects may occur throughout the watershed where actions described in this Opinion lead to additional activities or affect ecological functions contributing to aquatic and riparian habitat degradation. For this consultation, the action area includes the Rogue River from RM 1.5 to the confluence with the Pacific Ocean, and includes the adjacent riparian zone - defined as the area from the edge of the channel migration zone (CMZ) upslope 200 feet (slope distance); and includes the one acre mitigation site located near RM 2.65.

The project is within the Lower Rogue River watershed of the Rogue Basin. The watershed covers 908.57 square miles.

The Rogue Basin drains 5058 square miles in Southwestern Oregon and Northern California. The Rogue flows west from the headwaters in the Cascades near Crater Lake through interior valleys and coast range mountains of Southwest Oregon to the Pacific Ocean. The Rogue River has two main tributaries: The Illinois River enters the Rogue at RM 27, and the Applegate River enters the Rogue at RM 95.

The Rogue system has two main dams managed by the U.S. Army Corps of Engineers and hundreds of small water diversions. Lost Creek Dam was completed in 1977 at RM 157 on the mainstem of the Rogue. The Applegate Dam was completed in 1980 at RM 47 on the Applegate River. The dams have significantly altered the natural flow regime, temperature regime, and impaired fish passage and distribution in the Rogue River Basin.

The Lower Rogue River has been listed on the Oregon Department of Environmental Quality (DEQ) 303d list of waterbodies with water quality problems for temperature and pH.

The NMFS Matrix of Pathways and Indicators (NMFS 1996) was used to assess the current condition of various coho salmon and steelhead habitat parameters in the Lower Rogue watershed. Use of the Matrix identified the following habitat indicators as either at risk or not properly functioning within the action area: Temperature, sediment/turbidity, large woody debris recruitment potential, pool frequency, off-channel habitat, refugia, floodplain connectivity, peak/base flows, increase in drainage network, disturbance history, and riparian reserves.

1.5 Analysis of Effects

1.5.1 Effects of Proposed Action

The effects determination in this Opinion was made using a method for evaluating current aquatic conditions, the environmental baseline, and predicting effects of actions on them. This process is described in NMFS (1996). The effects of actions are expressed in terms of the expected effect - restore, maintain, or degrade - on aquatic habitat factors in the action area.

1.5.1.1 Bridge Rehabilitation

NMFS expects that there will be short-term and long-term effects associated with the bridge rehabilitation action. Specific effects associated with the rehabilitation action are: Pile installation and removal, construction, maintenance, and disassembly of the cathodic protection containment structure, contaminated water, petrochemical contamination and toxic substances, shading, and staging areas. An analysis of effects for each category of effects is described below.

1.5.1.1.1 Pile Installation and Removal and Containment Structure

NMFS expects that there will be short-term effects to coho salmon or steelhead from the installation and removal of 700 piles and the containment structure to coho salmon or steelhead or designated critical habitat. Timing of pile installation and removal will occur during the designated inwater work period. The total area of benthic habitat temporarily lost from pile installation is approximately 8050 square feet. The short-term effects associated with pile installation and removal will be increases in sedimentation and turbidity, loss of benthic habitats, and displacement of coho salmon or steelhead. Long-term spatial and temporal effects (greater than one year) may include changes in hydraulics and channel geometry, loss of benthic resources, and disruption to salmonid migration patterns. Additionally, these effects may reduce light penetration and inhibit primary production in the lower estuary depending on the intensity of the effect.

1.5.1.1.2 Contaminated Water

Contaminated water will be generated from bridge deck materials removal, and construction of the concrete footing for pier 2. Additionally, untreated stormwater runoff from the bridge will be directly imported into the Rogue River Estuary. Contaminated water, especially water with a high or low pH, has the potential to injure or kill fish. Contaminated water is defined as water with an increase in turbidity that is equal to or greater than 10% of background levels and/or water with a pH greater than or less than one point of background levels. Contaminated water from construction operations will not be discharged in the estuary, therefore impacts to salmonids and salmonid habitat parameters are not expected. Untreated stormwater runoff is not expected, in quantifiable terms, to adversely affect coho salmon or steelhead.

1.5.1.1.3 Petrochemicals and toxic substances

As with all construction activities, accidental release of petrochemicals may occur from refueling events, crank case failure, and rupture of hydraulic lines from non-mobile construction equipment. Track-mounted construction equipment will be on the work bridges over the Rogue River Estuary for extended periods of time. This equipment will be refueled on the work bridges. The work bridges will be constructed in a manner that minimizes petrochemicals from entering the Rogue River Estuary. Additionally, special refueling equipment and refueling limitations will further minimize petrochemical contamination to the Rogue River Estuary. Incidental release of petrochemicals or toxic substances into the active stream channel is not expected to, in quantifiable terms, adversely affect coho salmon or steelhead.

The annual volume of zinc sublimated from the bridge has been calculated at 3.3 gallons with a weight of 197 pounds. The average yearly flow in the Rogue River Estuary is 35.1×10^{10} cubic feet. The concentration of zinc contributed to the Rogue River Estuary has been calculated at .0085 part per billion (ppb). This is well below the marine water acute and chronic criteria set by the DEQ, which is 95 and 86 ppb, respectively. The fresh water acute and chronic criteria are 120 and 110 ppb,

respectively. The concentration of elemental zinc at these levels is not expected to, in quantifiable terms, adversely affect coho salmon or steelhead or water quality.

1.5.1.1.4 Shading - Work Bridges

Shading caused by structures and barges has the potential to provide habitat for piscivorous fish species that prey on migrating and rearing salmonids. While natural shading, as part of an integrated and complex habitat structure, provides essential functions to stream ecology and aquatic biota, shading caused by artificial means is not an integrated element of the intrinsic ecology and therefore does not create comparable functions. Shading from the work bridges (total area of work bridges 63,300 square feet) is not expected, in quantifiable terms, to lead to an increase in predation on coho salmon or steelhead. The work bridges will be 24.9 feet above sea level, 27.6 feet above mean lower low water elevation, and 17.7 feet above the two-year flood elevation.

1.5.1.1.5 Staging Areas

The existing breakwater dike will be used as a staging area, for access to and from the work bridges for transfer and storage of construction materials and debris from the containment structure, and for storage of non-hazardous materials. Auxiliary fuel tanks will not be stored on the breakwater dike. Conservation measures will be implemented and maintained to minimize impacts to salmonids and salmonid habitats from construction debris, non-hazardous materials, and petrochemicals from entering the Rogue River Estuary.

1.5.1.2 Inwater Work Isolation Area and Fish Removal

Inwater work may have adverse affects on coho salmon or steelhead in the isolated inwater work area. Installation of the coffer dam for construction of the new footing at pier 2 has the potential to isolate coho salmon or steelhead within the isolated work area. Isolation of coho salmon or steelhead may cause injury or death from asphyxiation, stress, or long-term entrapment. Fish removal methodology and handling of coho salmon or steelhead has the potential to cause injury or death. Removal methods will include netting and/or electroshocking. All inwater work will be completed during the established inwater work period to minimize impacts to juvenile coho salmon. Removal of the coffer dam will liberate sediments and increase turbidity in the Rogue River Estuary, and may displace or injure fish.

1.5.1.3 Shading - Barge Use

For the work on pier 2, barges may be used for sheet pile installation and removal and activities associated with the work on pier 2. Shading is not expected, in quantifiable terms, to lead to an increase in predation on coho salmon or steelhead. Barge use is not expected to adversely affect coho salmon or steelhead.

1.5.1.4 Scour Protection

The new footing constructed for pier 2 will permanently eliminate an additional 1400 square feet (for a total area of 3180 square feet) of estuarine habitat for coho salmon and steelhead. Loss of this habitat, while permanent, is not expected to adversely affect coho salmon or steelhead migration patterns or rearing behaviors, or significantly impact the overall functions of the deep pool habitat for salmonids, or significantly alter the ecology of the estuary. Changes in hydraulics from the new footing are not expected to be significant.

1.5.1.5 Mitigation

The riparian planting activities will increase the likelihood of a return to riparian function along the streambank near RM 2.65 and along the streambanks of Ranch Creek. The riparian area lies within designated critical habitat for SONC coho salmon and is within the geographic range of KMP steelhead. It will take at least five years of re-growth before function begins to return, and substantially more time before full riparian function returns.

1.5.2. Effects on Critical Habitat

NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features for designated critical habitat include substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space and safe passage. Critical habitat for SONC coho salmon consists of all waterways below naturally impassable barriers including the project area. The adjacent riparian zone is also included in the designation. This zone is defined as the area that provides the following functions: Shade, sediment, nutrient/chemical regulation, streambank stability, and input of large woody debris/organic matter.

The proposed actions will affect critical habitat. The temporary impacts to critical habitat from installation and removal of the 700 piles is not expected to diminish functions in the long term. Short-term effects from sedimentation and turbidity, and loss of benthic habitats are expected.

The new footing constructed for pier 2 will permanently eliminate an additional 1400 square feet (for a total footing area of 3180 square feet) of estuarine habitat for coho salmon and steelhead. Loss of this habitat, while permanent, is not expected to significantly impact the overall functions of the deep pool habitat for salmonids, or significantly alter the ecology of the estuary. Changes in hydraulics from the new footing are not expected to be significant. In the short term, increases in sedimentation and turbidity (from lateral scour) is expected from changes in hydraulics in the area of the new pier footing.

Vegetation removal is expected to be less than one acre, and will not involve the removal of any trees. Shrubs will be pruned at ground level. All ground disturbed areas will be replanted. In the long term, a loss of 1400 square feet of estuary habitat, minor changes to hydraulics and channel geometry is

expected. In the long term, a slow recovery process will occur at the three mitigation sites as the riparian vegetation matures providing an unquantifiable level of function. The NMFS does not expect that these actions will diminish the value of the habitat for survival of SONC coho salmon.

1.5.3. Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For the purposes of this analysis, the action area is defined as the Rogue River from RM 1.5 to the confluence with the Pacific Ocean, and includes the adjacent riparian zone - defined as the area from the edge of the CMZ upslope 200 feet (slope distance); and includes the one acre mitigation site located near RM 2.65.

NMFS is not aware of any significant change in non-Federal activities that are reasonably certain to occur. In the future, NMFS assumes that future private and State actions will continue at similar intensities as in recent years. Future FHWA/ODOT transportation projects are planned in the Rogue River watershed. Each of these projects will be reviewed through separate section 7 consultation processes and therefore are not considered cumulative effects.

1.6. Conclusion

On April 4, 2001, NMFS announced that Klamath Mountains Province steelhead do not warrant listing under ESA, thus this species will not be considered any further as part of this consultation.

NMFS has determined that, based on the available information, the Rogue River Bridge Rehabilitation Project is not likely to jeopardize the continued existence of Southern Oregon/Northern California Coasts coho salmon or result in the destruction or adverse modification of critical habitat. NMFS used the best available scientific and commercial data to apply its jeopardy analysis, when analyzing the effects of the proposed action on the biological requirements of the species relative to the environmental baseline, together with cumulative effects. NMFS applied its evaluation methodology (NMFS 1996) to the proposed action and found that it would cause minor, short-term degradation of anadromous salmonid habitat due to increases in sedimentation and turbidity, loss of benthic resources, and instream habitat loss. These effects will be minimized, to an unquantifiable extent, over the long term through the implementation of proposed riparian plantings. For the proposed actions, the NMFS expects that the effects will tend to maintain or restore each of the habitat elements over the long term, greater than five years, based on the current condition of the site. In the short term, increases in sedimentation and turbidity, changes to hydraulics and channel geometry, loss of benthic habitats, displacement of coho salmon or steelhead, and disruption to migration patterns is expected. Fish may be killed, or more likely, temporarily displaced by the inwater work activities. The potential effects from the sum total of proposed actions including habitat enhancement activities are expected to maintain or restore the function of coho salmon and steelhead habitat conditions.

1.7. Reinitiation of Consultation

Consultation must be reinitiated if: 1) The amount or extent of taking specified in the incidental take statement is exceeded, or is expected to be exceeded; 2) new information reveals effects of the action may affect listed species in a way not previously considered; 3) the action is modified in a way that causes an effect on listed species that was not previously considered; or, 4) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16). To reinitiate consultation, ODOT must contact the Habitat Conservation Division (Oregon Branch Office) of NMFS.

2. INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, and sheltering. Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

2.1. Amount or Extent of the Take

The NMFS anticipates that the action covered by this Opinion has more than a negligible likelihood of resulting in incidental take of SONC coho salmon because of detrimental effects from increases in sedimentation and turbidity, disruption to migration patterns, and the loss of habitat (non-lethal) and the potential for direct incidental take during inwater work (lethal and non-lethal). Effects of actions such as these are largely unquantifiable in the short term, and are not expected to be measurable as long-term effects on coho salmon or steelhead habitat or population levels. Therefore, even though NMFS expects some low level of incidental take to occur due to the actions covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of incidental take to the species. In instances such as these, the NMFS designates the expected level of take as "unquantifiable." Based on the information in the biological assessment,

NMFS anticipates that an unquantifiable amount of incidental take could occur as a result of the actions covered by this Opinion. For the purposes of this Opinion, the extent of non-lethal take is limited to RM 1.5 to the confluence with the Pacific Ocean. Lethal take is defined as and limited to killing and harm, and is limited to RM 1.0 to RM 0.8. Lethal take shall not exceed 25 SONC juvenile coho salmon.

2.2. Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of the above species. Minimizing the amount and extent of take is essential to avoid jeopardy to the listed species.

The FHWA/ODOT shall:

1. Minimize the amount and extent of incidental take from construction activities within the proposed action area by ensuring that measures are taken to limit the duration and extent of inwater work, and to time such work when the impacts to SONC coho salmon are minimized.
2. Minimize the amount and extent of incidental take from construction activities in or near watercourses by ensuring that effective erosion and sedimentation control measures are developed, implemented, and maintained to avoid or minimize the movement of soils and sediment both into and within watercourses and to stabilize bare soil over both the short term and the long term.
3. Minimize the amount and extent of incidental take from constructions activities in or near watercourses by ensuring that an effective spill prevention, containment, and control plan is developed, implemented, and maintained to avoid or minimize point-source pollution both into and within watercourses over the short term and the long term.
4. Minimize the extent of impacts to riparian, riverine, and estuarine habitats, or where impacts are unavoidable, replace or restore lost riparian, riverine, or estuarine functions.
5. To ensure effectiveness of implementation of the reasonable and prudent measures, all fish removal and handling, spill containment, prevention and control plans, hazardous materials, and mitigation sites shall be monitored and evaluated both during and following construction, and meet criteria as described below in the terms and conditions.

2.3. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, FHWA/ODOT must comply with the following terms and conditions, which will implement the reasonable and prudent measures described above. These terms and conditions should be incorporated into construction contracts and subcontracts to ensure that the work is carried out in the manner prescribed. Implementation of the terms and conditions within this Opinion will further reduce the risk of impacts to fish and critical habitat. These terms and conditions are non-discretionary.

1. To implement Reasonable and Prudent Measure #1, above, the FHWA/ODOT shall ensure that:
 - a. Passage is provided for both adult and juvenile forms of all salmonid species throughout the construction period. The FHWA/ODOT designs will ensure passage of fish as per Oregon Revised Statutes (ORS) 498.268 and ORS 509.605.
 - b. All work within the active channel of the Rogue River will be completed within the NMFS/ODFW approved inwater work period, October 1 to April 30; except for the first year of construction when the inwater work period will occur from September 1 to April 30. Any adjustments to the inwater work period will first be approved by, and coordinated with, NMFS and ODFW. An extension of the inwater work window may require reinitiation of section 7 consultation.
 - c. The alteration or disturbance of streambanks and existing riparian vegetation will be minimized. Where bank work is necessary, bank protection material shall be placed to maintain normal waterway configuration.
 - d. The diversion or withdrawal of all water from the stream, if any, and used for construction or for mitigation will comply with all state and Federal laws, particularly those that require a temporary water right and screening of intakes. The FHWA/ODOT shall be responsible for informing all contractors of their obligations to comply with existing, applicable statutes.
 - e. An ODFW/ODOT biologist will be on site and responsible to ensure that fish trapped within the isolated work area are removed by using the least destructive technology that is feasible, prior to any construction activity occurring within the isolation facility, including de-watering.
 - i. Within three months of any fish removal activities, the FHWA/ODOT shall provide a report to NMFS that contains all of the information for reporting take that is contained in the Oregon Department of Fish and

Wildlife Scientific Taking Permit application and in the OPSW 2001 Supplemental Application Request.

- ii. In the event that any listed species is injured or killed, care will be taken in handling of injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death and ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.
 - iii. If the lethal take limit is exceeded, construction operations shall stop. FHWA/ODOT will notify the Oregon State Branch of the NMFS, Habitat Conservation Division, at 503-231-6892. Exceeding the take limit requires reinitiation of section 7 consultation.
- 2. To implement Reasonable and Prudent Measure #2, above, the FHWA/ODOT shall ensure that:
 - a. An erosion control plan (ECP) is prepared by ODOT's Erosion Control Team and implemented by the Contractor. The ECP will outline how and to what specifications various erosion control devices will be installed to meet water quality standards, and will provide a specific inspection protocol and time response. Erosion control measures shall be sufficient to ensure compliance with applicable water quality standards and this Opinion. The ECP shall be maintained on site and shall be available for review upon request. Erosion and sedimentation control measures may include (but not limited to) the following:
 - i. Sediment detention measures such as placement of weed-free straw, silt fences, straw bale barriers, temporary seeding, storm drain inlet protection, sediment traps, and construction of temporary settling basins where appropriate.
 - ii. Erosion control blankets or heavy duty matting (e.g., jute) may be used on steep, unstable slopes.
 - b. Effective erosion control measures shall be in-place at all times during the contract. Construction within 25 feet of the two-year floodplain will not begin until all temporary erosion controls are in place, downslope of project activities within the riparian area.
 - c. All exposed areas will be replanted with native vegetation. Erosion control planting, and placement of erosion control blankets and mats will be completed

on all areas of bare soil within seven days of exposure within 150 feet of any waterbody, and in all areas during the wet season (after October 1). All other areas will be stabilized within 14 days of exposure. Efforts will be made to cover exposed areas as soon as possible after exposure.

- b. All erosion control devices will be inspected throughout the construction period to ensure that they are working adequately. Work crews will be mobilized to make immediate repairs to the erosion controls, or to install erosion controls during working and off-hours. Should a control measure not function effectively, the control measure will be immediately repaired or replaced. Additional erosion controls will be installed as necessary.
 - c. In the event that soil erosion and sediment resulting from construction activities is not effectively controlled, the engineer will limit the amount of disturbed area to that which can be adequately controlled.
 - d. Prior to operating within 300 feet of the two-year floodplain, inspect and clean all construction equipment. Remove external oil, grease, dirt, and mud. Untreated wash and rinse water will not be discharged into streams and rivers without adequate treatment.
 - e. Materials removed during rehabilitation and excavation shall only be placed in upland locations at least 300 feet from the two-year floodplain to ensure that excavated materials do not re-enter the two-year floodplain. Conservation of topsoil (removal, storage and reuse) will be employed.
 - f. Where feasible, sediment-laden water created by construction activities shall be filtered before it enters any waterbody.
 - g. Pile removal methods shall not include jetting. Piles shall be completely removed; piles that incidentally break, below ground-line, may be left in place.
 - h. Project actions meet or exceed all provisions of the Clean Water Act (40 CFR Subchapter D) and Oregon Department of Environmental Quality for the National Pollution Discharge Elimination System (NPDES) permit and the Rogue River Basin (OAR Chapter 340, Division 41).
3. To implement Reasonable and Prudent Measure #3, above, the FHWA/ODOT shall ensure that:

- a. The Contractor will develop and implement a site-specific spill prevention, containment, and control plan (SPCCP), and is responsible for containment and removal of any toxicants released. The Contractor will be monitored by the ODOT Engineer to ensure compliance with this SPCCP.
- b. Any spill will be reported to the NMFS.
 - i. In the event of a hazardous materials or petrochemical spill, immediate action shall be taken to recover toxic materials from further impacting aquatic or riparian resources.
 - ii. In the event of a hazardous materials or petrochemical spill, a detailed description of the quantity, type, source, reason for the spill, and actions taken to recover materials will be documented.
- c. The work bridges and containment structure will have containment measures in place that minimizes any potential of petrochemicals or hazardous materials from entering the estuary.
 - i. The decking of the work bridges shall be constructed to self-contain petrochemicals and hazardous materials from entering the two-year floodplain.
- d. Measures will be taken to prevent construction debris from falling into any waterbody from the containment structure and the work bridges. Construction materials that fall into waterbodies during construction operations shall be removed, where feasible, in a manner that has a minimum impact on the streambed and water quality.
- e. Refueling and hazardous materials.
 - i. The refueling plans are submitted to NMFS for review and approval prior to any on-the-ground construction operations.
 - a. Fuel storage locations within 300 feet of the two-year floodplain shall have containment measures in place that meets or exceeds 100% containment.
 - b. Auxiliary fuel tanks are not stored on the work bridges, the breakwater dike, or within the two-year floodplain.

- ii. Hazardous materials stored within 300 feet of the two-year floodplain shall have containment measures in place that meets or exceeds 100% containment.
 - iii. No hazardous materials are stored on the work bridges.
 - f. The barges used for construction operations implement the following conditions:
 - i. The refueling plans for barge operations are submitted to NMFS for review and approval prior to any on-the-ground construction operations.
 - ii. No hazardous materials shall be stored on the barges.
 - iii. Barge use is limited to construction operations associated with the scour protection activities.
- 4. To implement Reasonable and Prudent Measure #4, above, the FHWA/ODOT shall ensure that:
 - a. Alteration of native vegetation is minimized. Where possible, native vegetation will be removed in a manner that ensures that roots are left intact.
 - b. All exposed areas greater than 250 square feet within the riparian corridor will have a replanting plan which is appropriate for the local overstory and understory plant community. The replanting plan will emphasize endemic riparian species.
 - c. The three mitigation sites shall be planted within the first year of construction (2001 - 2002).
 - d. The mitigation sites are monitored for three years with a survival rate of 80%.
- 5. To implement Reasonable and Prudent Measure #5, above, the FHWA/ODOT shall ensure that:
 - a. Within three months following completion of any fish removal activities, a report that contains all of the information for reporting take that is contained in the ODFW scientific Taking Permit application is provided to NMFS.

- b. Upon completion of the project, a copy of all monitoring reports on the effectiveness of implementing and maintaining the SPCCPs are provided to NMFS.
- c. An annual report on the success of the mitigation sites are provided to NMFS.

3. MAGNUSON-STEVENSON ACT

Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish new requirements for EFH descriptions in Federal fishery management plans and to require Federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act §3). The Pacific Fisheries Management Council (PFMC) is one of eight regional fishery management councils established under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). PFMC develops and carries out fisheries management plans for groundfish (i.e., flatfish and rockfish), coastal pelagic fish (i.e., sardine), and salmon species off the coasts of Washington, Oregon and California, and recommends Pacific halibut harvest regulations to the International Pacific Halibut Commission.

The PFMC has recommended an EFH designation for the Pacific salmon fishery that would include those waters and substrate necessary to ensure the production needed to support a long term sustainable fishery (*i.e.*, properly functioning habitat conditions necessary for the long term survival of the species through the full range of environmental variation). The Rogue River and estuary is designated EFH for groundfish, coastal pelagic species, and Pacific salmon (Table 1).

The Magnuson-Stevens Act requires consultation for all actions that may adversely affect EFH, and it does not distinguish between actions in EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities that may have an adverse effect on EFH. Therefore, EFH consultation with NMFS is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

The consultation requirements of section 305(b) of the Magnuson-Stevens Act [16 U.S.C. 1855(b)] provide that:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

- NMFS shall provide conservation recommendations for any Federal or State activity that may adversely affect EFH;
- Federal agencies shall within 30 days after receiving conservation recommendations from NMFS provide a detailed response in writing to NMFS regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NMFS, the Federal agency shall explain its reasons for not following the recommendations.

Identification of Essential Fish Habitat

Designated salmon EFH includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to groundfish, coastal pelagic species, and Pacific salmon in Washington, Oregon, Idaho, and California, except above the impassable barriers identified by PFMC (PFMC 1999). Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). In the estuarine and marine areas, proposed designated EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the U.S. Exclusive Economic Zone (EEZ), 200 miles offshore of Washington, Oregon, and California north of Point Conception (PFMC 1999).

Proposed Action

The proposed actions are detailed above and in the biological assessment.

For the purposes of this analysis, the action area is defined as the Rogue River from RM 1.5 to the confluence with the Pacific Ocean, and includes the adjacent riparian zone, defined as the area from the edge of the CMZ upslope 200 feet (slope distance); and includes the one acre mitigation site located near RM 2.65. These waters are part of the proposed designated EFH for groundfish, coastal pelagic species, and Pacific salmon (PFMC 1999). A description and identification of EFH for groundfish, coastal pelagic species, and Pacific salmon is found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999).

The objective of this EFH consultation is to determine whether the proposed action is likely to adversely affect EFH for groundfish, coastal pelagic species, and Pacific salmon.

Effects of the Proposed Action

The Rogue River Bridge Rehabilitation Project is not likely to adversely affect the distribution and abundance of adult or juvenile salmonids. The proposed action will result in short-term impacts to

groundfish, coastal pelagic species, and Pacific salmonid habitat; i.e., increases in sedimentation and turbidity, and alteration to benthic habitats. Long-term spatial (from RM 1 downstream to the confluence of the Pacific Ocean) and temporal (greater than one year) effects will principally effect benthic habitats, channel geometry, and flow dynamics.

Conclusion

The NMFS believes that the proposed action is likely adversely affect proposed designated EFH for groundfish, coastal pelagic species, and Pacific salmon.

EFH Conservation Recommendations

The conservation measures that FHWA/ODOT included as part of the proposed action are adequate to minimize the adverse impacts from this project to designated EFH for salmon, groundfish, and coastal pelagics. It is NMFS' understanding that FHWA/ODOT intends to implement the proposed activity with these built-in conservation measures that minimize potential adverse effects. Furthermore, the reasonable and prudent measures and the terms and conditions outlined above in section 2 are applicable to designated EFH. Consequently, NMFS has no additional conservation recommendations to make at this time.

Statutory Response Requirements

Please note that the Magnuson-Stevens Act (section 305(b)) and 50 CFR 600.920(j) requires the Federal agency to provide a written response to NMFS' EFH conservation recommendations within 30 days of its receipt of this letter. However, since NMFS did not provide conservation recommendations for this action, a written response to this consultation is not necessary.

Consultation Renewal

The ODOT must reinitiate EFH consultation with NMFS if the action is substantially revised in a manner that may adversely affect EFH or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR Section 600.920 [k]).

Table 1. Species with designated EFH found in waters of the State of Oregon.¹

Ground Fish Species	Blue rockfish (<i>S. mystinus</i>)	Rougheye rockfish (<i>S. aleutianus</i>)	Flathead sole (<i>Hippoglossoides elassodon</i>)
Leopard shark (<i>Triakis semifasciata</i>)	Bocaccio (<i>S. paucispinis</i>)	Sharpchin rockfish (<i>S. zacentrus</i>)	Pacific sanddab (<i>Citharichthys sordidus</i>)
Soupin shark (<i>Galeorhinus zyopterus</i>)	Brown rockfish (<i>S. auriculatus</i>)	Shortbelly rockfish (<i>S. jordani</i>)	Petrale sole (<i>Eopsetta jordani</i>)
Spiny dogfish (<i>Squalus acanthias</i>)	Canary rockfish (<i>S. pinniger</i>)	Shortraker rockfish (<i>S. borealis</i>)	Rex sole (<i>Glyptocephalus zachirus</i>)
Big skate (<i>Raja binoculata</i>)	Chilipepper (<i>S. goodei</i>)	Silvergray rockfish (<i>S. brevispinus</i>)	Rock sole (<i>Lepidopsetta bilineata</i>)
California skate (<i>R. inornata</i>)	China rockfish (<i>S. nebulosus</i>)	Speckled rockfish (<i>S. ovalis</i>)	Sand sole (<i>Psettichthys melanostictus</i>)
Longnose skate (<i>R. rhina</i>)	Copper rockfish (<i>S. caurinus</i>)	Splitnose rockfish (<i>S. diploproa</i>)	Starry flounder (<i>Platyichthys stellatus</i>)
Ratfish (<i>Hydrolagus colliei</i>)	Darkblotched rockfish (<i>S. crameri</i>)	Stripetail rockfish (<i>S. saxicola</i>)	
Pacific rattail (<i>Coryphaenoides acrolepis</i>)	Grass rockfish (<i>S. rastrelliger</i>)	Tiger rockfish (<i>S. nigrocinctus</i>)	Coastal Pelagic Species
Lingcod (<i>Ophiodon elongatus</i>)	Greenspotted rockfish (<i>S. chlorostictus</i>)	Vermillion rockfish (<i>S. miniatus</i>)	Northern anchovy (<i>Engraulis mordax</i>)
Cabezon (<i>Scorpaenichthys marmoratus</i>)	Greenstriped rockfish (<i>S. elongatus</i>)	Widow Rockfish (<i>S. entomelas</i>)	Pacific sardine (<i>Sardinops sagax</i>)
Kelp greenling (<i>Hexagrammos decagrammus</i>)	Longspine thornyhead (<i>Sebastolobus altivelis</i>)	Yelloweye rockfish (<i>S. ruberrimus</i>)	Pacific mackerel (<i>Scomber japonicus</i>)
Pacific cod (<i>Gadus macrocephalus</i>)	Shortspine thornyhead (<i>Sebastolobus alascanus</i>)	Yellowmouth rockfish (<i>S. reedi</i>)	Jack mackerel (<i>Trachurus symmetricus</i>)
Pacific whiting (Hake) (<i>Merluccius productus</i>)	Pacific Ocean perch (<i>S. alutus</i>)	Yellowtail rockfish (<i>S. flavidus</i>)	Market squid (<i>Loligo opalescens</i>)
Sablefish (<i>Anoplopoma fimbria</i>)	Quillback rockfish (<i>S. maliger</i>)	Arrowtooth flounder (<i>Atheresthes stomias</i>)	
Aurora rockfish (<i>Sebastes aurora</i>)	Redbanded rockfish (<i>S. babcocki</i>)	Butter sole (<i>Isopsetta isolepsis</i>)	Salmon
Bank Rockfish (<i>S. rufus</i>)	Redstripe rockfish (<i>S. proriger</i>)	Curlfin sole (<i>Pleuronichthys decurrens</i>)	Coho salmon (<i>O. kisutch</i>)
Black rockfish (<i>S. melanops</i>)	Rosethorn rockfish (<i>S. helvomaculatus</i>)	Dover sole (<i>Microstomus pacificus</i>)	Chinook salmon (<i>O. tshawytscha</i>)
Blackgill rockfish (<i>S. melanostomus</i>)	Rosy rockfish (<i>S. rosaceus</i>)	English sole (<i>Parophrys vetulus</i>)	

1. From Casillas *et al* 1998, Dees 1961, Emmett *et al.* 1991, Eschmeyer *et al.* 1983, Fields 1965, Gotshall 1977, Hart 1973, Healey 1991, Miller and Lea 1972, Monaco *et al.* 1990, Phillips 1957, Phillips 1964, Roedel 1948, Roedel 1953, Sandercock 1991, Turner and Sexsmith 1967, and Walford 1931.

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